Labeling hESCs and hMSCs with iron oxide nanoparticles for non-invasive in vivo tracking with MR imaging.

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Public Summary:

Scientific Abstract:
In recent years, stem cell research has led to a better understanding of developmental biology, various diseases and its potential impact on regenerative medicine. A non-invasive method to monitor the transplanted stem cells repeatedly in vivo would greatly enhance our ability to understand the mechanisms that control stem cell death and identify trophic factors and signaling pathways that improve stem cell engraftment. MR imaging has been proven to be an effective tool for the in vivo depiction of stem cells with near microscopic anatomical resolution. In order to detect stem cells with MR, the cells have to be labeled with cell specific MR contrast agents. For this purpose, iron oxide nanoparticles, such as superparamagnetic iron oxide particles (SPIO), are applied, because of their high sensitivity for cell detection and their excellent biocompatibility. SPIO particles are composed of an iron oxide core and a dextran, carboxydextran or starch coat, and function by creating local field inhomogeneities, that cause a decreased signal on T2-weighted MR images. This presentation will demonstrate techniques for labeling of stem cells with clinically applicable MR contrast agents for subsequent non-invasive in vivo tracking of the labeled cells with MR imaging.